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VIII. *An Account of an Essay on the Origin of a natural Paper, found near the City of Cortona in Tuscany. In a Letter from John Strange, Esq; F. R. S. to Mathew Maty, M. D. Sec. R. S.*

DEAR SIR,

Read February 16,  
1769.

**M**Y letter to Mr. Coltellini, secretary to the Botanical Academy of Cortona, concerning the origin of a natural paper found in the neighbourhood of that city (which, with some specimens of paper, you obligingly presented to the Royal Society in my name), being written in a foreign language, and but little known; I have thought proper to give you the following short account of it, together with some additional remarks, which I have made since its publication.

In August 1763, some low grounds, in a farm about four miles south-west of Cortona, which had been flooded, were found covered with a substance very much like a finer sort of common brown paper. A circumstantial account of the fact was communicated to the public the September following, in a letter from the said Mr. Coltellini to Dr. Lami, professor of theology at Florence.

This account surprised, and excited the curiosity of the naturalists in Italy; and various were the con-

jectures

jectures offered upon the occasion. The prevailing opinion, however, attributed the formation of this paper to a casual aggregate of the fibres of different kinds of filamentous plants, collected together by the waters, and left on the surface of the ground at their retreat. This supposition seemed plausible enough, since such a mechanism could be produced only by filamentous plants; most of which are commonly the spontaneous productions of such low, marshy ground. But upon considering that, in the paper manufactures of different countries, various degrees and methods of maceration are requisite, according to the respective qualities of the fibres of different plants; it appeared to me very difficult to conceive, that a paper of so delicate and uniform a texture as that of Cortona should owe its origin to so complicated and remote a cause.

To bring the matter in question to a more certain issue, I therefore thought it necessary to examine the threads of this paper with a good microscope; and, agreeable to the opinion I had entertained, found them to consist of mere filaments of the common species of *Conferva*, without the intervention of any other plant whatsoever. It was easy enough to ascertain the identity of the *Conferva*, the filaments of which it is composed being of a peculiar structure, and very different from those of any terrestrial plant; besides, as they are solitary in their natural state, they undergo no other alteration by the above mechanism, than the loss of the *parenchyma* that invests them, the structure of the filaments themselves remaining as perfect as ever.

To confess the truth, I was but very superficially acquainted with this species of *Conferva* till I had made the above discovery; since the descriptions of it, which we find in the books of botany, by no means afford an adequate idea of the structure of the plant. Dillenius (1), in his description of it, pretending to correct Pliny, for a supposed impropriety in the term *fistulosæ densitatis*, says, that there is no cavity observable either in this or other larger species of *Conferva*, excepting, perhaps, in his *Conferva dichotoma* (2); in which he is certainly mistaken; since the filaments of the common *Conferva*, when examined with a good microscope, evidently appear to be capillary tubes divided at equal distances by parallel *septa* or diaphragms, exactly like the 25th species of the same *genus* in Dillenius's Tables. Pliny's (3) epithet, therefore, so far from being improper, is a real characteristic of the thing in question.

As the systematical botanists generally take their leading characters from the external figures of plants, we need not be surprised to find them inaccurate in their descriptions of the smaller tribes; more especially as they neglect the use of proper glasses, by which alone they can acquire a knowledge of them. Dillenius and Linnæus himself have both been led into mistakes, from this omission. The former, in the preface to his *Historia Muscorum*, confesses, that he made use of common glasses only, in order that the figures of the smaller plants, which he was to

(1) Hist. Musc. Gen. 1. Ord. 1. Sp. 1, 2.

(2) lb. Gen. 2. Sp. 9. (3) Hist. Nat. lib. XXVII. cap. viii.

represent

represent in his Tables, might not deviate too much from the natural appearance of the plants themselves to the naked eye : and it is pretty evident that the glasses he used were but of moderate powers, since, besides other mistakes, they left him quite undetermined whether his 4th and 5th species of *Conferva* had ramifications or not, though this very distinction forms a separate series in the first *Ordo*. Linnæus's (4) generical character of this plant is certainly less defective than that given by Dillenius, inasmuch as he takes notice of the tubercula omitted by the former, and calls the fibres of the *Conferva capillary*; but as he does not expressly say, whether these fibres are tubes or not, and takes no notice of the *septa* or diaphragms distributed at equal distances along them, I apprehend that he equally neglected examining the plant with proper glasses. Perhaps he adopted the term *capillaris* from professor Van Royen's Synonyme, which he quotes; especially since, in his divisions and specific characters of the *Conferva*, he has fallen into the same mistakes with Dillenius, whom he chiefly followed in his class of the *Cryptogamia*.

If the systematical botanists have not therefore acquired an adequate knowledge of the structure of the minuter *Confervæ*, by neglecting to use proper glasses, their descriptions of these plants must necessarily be imperfect.

The specimens of paper, which I sent you with the copy of my letter, are,

First, A specimen of the natural paper of Cortona.

Secondly, An artificial paper made of the same substance with the natural paper of Cortona; which

substance I prove (5) to be the common *Conferva*; but as the plant, by mistake, was not kept long enough in maceration, the parenchymous matter, which ought to have been separated from it, is in part still remaining, and gives the paper a greenish colour, besides making it very brittle.

Thirdly, A specimen of a much better and stronger paper made of the same *Conferva*, by Sir Alexander Dick, baronet, near Edinburgh; and I remember seeing others of the same sort, but of inferior quality, made by Mons. *Guettard*, of Paris; an account of which has been already printed (6).

Fourthly, A specimen of another artificial paper, which I made of the *Genista Juncea* macerated in warm water, and prepared afterwards in the common manner. I do not recollect, that this substance was ever tried before; neither is the *Genista Juncea* inserted in the list of filamentous plants published by Monsieur *De la Lande* (7). This anecdote, though *Vitruvius* (8) recommended it for similar uses so many centuries ago, was new to Monsieur *De la Lande*, when I had the opportunity of communicating it to him at Paris on my return from Italy in 1764.

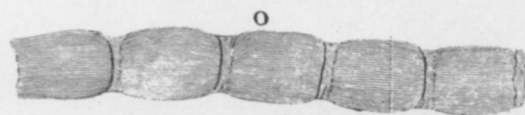
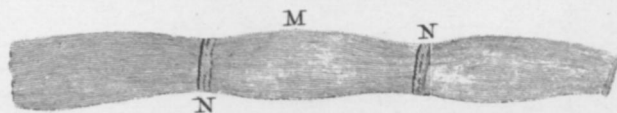
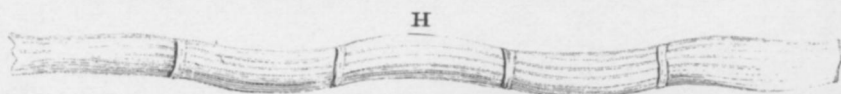
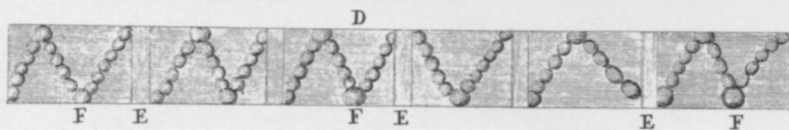
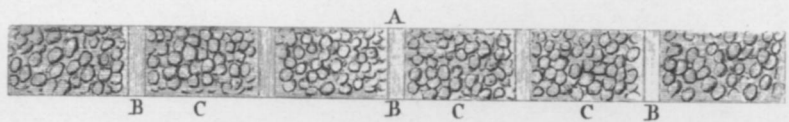
These matters are, I confess, of more speculation and curiosity than use; but as they have given occasion, in the course of my inquiry, to some physical and botanical remarks, I thought they might not prove wholly unacceptable to the learned members of the Royal Society; and should think myself very happy, if other gentlemen, of greater knowledge

(5) See the Table of References to the Figures.

(6) Journ. Œcon. Avril, 1761.

(7) Art de faire du Papier.

(8) Archit. lib. VII. cap. iii.



and abilities than myself, should be hereby encouraged to pursue the above hints, in order to obtain a more accurate knowledge of a genus of plants hitherto but imperfectly described, and perhaps less known than any other of the *Cryptogamia* class. I am,

Dear Sir,

Your most obedient,

and humble servant,

John Strange.

Appearances of the *Conferva Plinii*, viewed in different states with the microscope; with references to the plate. See Tab. II.

- A. *Conferva Plinii*, in its natural vigorous state, of a deep green colour; taken from the fountain in the middle of the botanical garden at Florence.
- B. B. B. Transverse membranes or diaphragms, apparently of a spongy nature, and transparent.
- C. C. C. Parenchyma which gives the deep green colour to this plant, replete with globular appearances, like air-bladders.
- D. *Conferva Plinii*, of a yellowish green colour; taken from a fountain in Marquis Grifoni's garden at Florence. This plant was in the first stage of putrefaction, a great part of its parenchyma being dissolved and separated from it: hence its degradation of colour.

E. E. E. The



- E. E. E. The transparent diaphragms.
- F. F. F. Appearance of the parenchyma with fewer, but apparently regular vesicles of air.
- G. *Conferva Plinii* A. dried between two pieces of glass, and thereby contracted at the joints. The parenchyma of the plant had stuck these pieces of glass so fast together, that they were with difficulty separated.
- H. *Conferva Plinii* D. dried between two pieces of glass. The apparently longitudinal fibres are nothing but foldings of the membranous tube ; for, on moistening the plant, and moving the pieces of glass in different directions, these foldings increase or decrease arbitrarily.
- I. K. L. Appearances of *Conferva Plinii*, taken from three different places in the canals about Pisa, afterwards steeped for fifteen days in common water, then extended upon paper to dry, and put a second time into water for an hour.
- M. Appearance of a thread of the natural paper of Cortona, with the diaphragms NN appearing opaque.
- O. A thread of the same paper, steeped for an hour in common water.